UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/810,932	03/16/2001	Keith R. Jones	MNDSPD.0005P	7235

7590 08/11/2004

Chad W. Miller
Bank West Building
5th floor Suite 530
7251 West Lake Mead Blvd
Las Vegas, NV 89128

EXAMINER	
WEST, JEFFREY R	

ART UNIT	PAPER NUMBER
2857	

DATE MAILED: 08/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/810,932	JONES ET AL.	
	Examiner	Art Unit	
	Jeffrey R. West	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13,21-30,40-54 and 60-70* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-13,21-29,40-54 and 60-70* is/are rejected.

7)☒ Claim(s) *6 and 30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 March 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/06/03, 12/15/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. In view of the Appeal Brief filed on December 19, 2003, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Specification

2. The disclosure is objected to because of the following informalities:

The description on page 25, lines 17-19 is confusing because the multipliers are referenced by both reference characters and setting values. The amended specification still refers to "a multiplier 514B C_{N-1}" and "a multiplier 514C that has a multiplier C_N." It is suggested that "connecting to a delay register 510C and to a multiplier 514B C_{N-1}. The output of delay register 510C connects to a multiplier 514C that has a multiplier C_N" be changed to match the language of the description on page 25, line 16, as --- connecting to a delay register 510C and to a multiplier

514B, set to C_{N-1}. The output of delay register 510C connects to a multiplier 514C, set to C_N---.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 7, 8 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,298,118 to Liggett

Liggett teaches a method and communication device for testing a twisted pair communication channel using time domain reflectometry (column 4, lines 11-16) comprising a pseudo-random code processor that generates and modifies pseudo-random coded signals to be transmitted on, and received from, the twisted pair conductor channel (column 4, lines 64-67), such as an asymmetric digital subscriber line (column 3, lines 48-49) connected to a computer modem for communication on the channel (column 3, lines 33-34), wherein the signals are sent at a low energy (i.e. power) level to lower the possibility of cross-talk occurring across the various twisted line channels (column 5, lines 9-12). Liggett also teaches that the transmitted signals (i.e. test signals) are generated using a code generator that reads from a shift register memory to define a specified maximal length sequence

code, with corresponding taps, (column 5, lines 13-18 and 25-30) which is transmitted over the communication channel and reflected back; in response to the transmission, to the receiver for sending to a cross-correlator (column 5, lines 18-24), inherently with processing code, which correlates the original maximal length sequence signal with the reflected signal (column 5, lines 51-55). Liggett also teaches that a peak detector detects a plurality of peaks (i.e. signal components) of the reflected signal including peaks in response to an unwanted near-end echo pulse at the start of the signal, caused by reflection at the line interface, and a bridged tap in the communication channel (column 7, lines 30-37).

Further, due to the fact that the input signal of Liggett is a maximal length sequence signal it is considered inherent that the input test signal of Liggett has good auto-correlation properties (see for example U.S. Patent No. 6,480,504 to Wang et al., column 6, lines 1-2, for support of the inherent properties of a maximal length sequence signal) and it is also considered inherent that a bridge tap corresponds to an impedance mismatch (see for example U.S. Patent Application Publication No. 2002/0114383-A1 to Belge et al. 0073 and 0076 for support).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-5, 12, 26, 27, 29, 40, 41, 43, 60-62, 64-67, 69, and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of U.S. Patent No. 6,534,996 to Amrany et al. and U.S. Patent No. 5,600,248 to Westrom et al.

As noted above, the invention of Liggett teaches many of the features of the claimed invention including indicating the occurrence of an unwanted near-end echo. Liggett, however, teaches implementing the method using a remote device, rather than using an existing modem, and does not teach a method for removing the unwanted near-end echo or a method for measuring the location of the fault in the communication line.

Amrany teaches a system and method for phone line characterization by time domain reflectometry comprising a method for transmitting and receiving reflection signals sent using components and processor code/software existing in a DSL modem (i.e. processor components, transmitting components, receiving components, and signal generating components that are configured to operate as part of the DSL during normal communication) connected to a communication channel (column 1, lines 51-67, column 6, lines 19-29, and Figure 5). Amrany teaches that the reflected signal is analyzed to determine the type and location of impedance disruptions (column 3, lines 20-41) of the twisted pair transmission line (column 3, lines 48-50). Amrany also teaches including an echo canceller (column 4, line 63), a finite impulse response filter (column 5, lies 4-6), and a de-convolution means, with processing functions similar to that of the correlation means of Liggett,

to detect phase differences and corresponding coefficients in determining the line abnormalities (column 9, lines 9-57).

Westrom teaches a fault distance locator for underground cable circuits comprising generating a pulse into a communication channel to obtain a reference pulse signal (i.e. template), during a setup operation, (column 4, lines 62-65) and, during actual operation, receiving a plurality of reflected pulses (column 8, lines 41-51) including an unwanted near-end echo pulse, caused by the reflection at the line interface, which is removed by subtracting the obtained reference/template pulse data from the actual received pulse data set (column 9, lines 9-21). Westrom then teaches determining a time interval between the beginning of the pulse injection and the subsequent peak/pulse (i.e. point of correlation) indicative of a line abnormality and then multiplying the time interval times the propagation speed to determine the distance to the location of the fault (column 9, lines 56-64). Westrom also teaches a computer controller comprising a microprocessor and a corresponding memory for storing a program, executed by the microprocessor, that initiates the generation of the input pulses, calculates the time interval to the fault (column 8, lines 14-21), and also connects to a modem to report monitoring information (column 6, lines 40-45).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett to include using an existing modem for carrying out the time-domain reflectometry method, as taught by Amrany, because, as suggested by Amrany, the combination would have reduced costs by using existing circuitry rather

than requiring separate circuitry and eliminated the need for test equipment that may introduce disturbance effects (column 1, lines 40-47 and column 6, lines 19-29).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett to include a method for removing the unwanted near-end echo and a method for measuring the location of the fault in the communication line, as taught by Westrom, since Liggett teaches that the near-end echo pulse is undesired and not used in measurements and Westrom provides a corresponding method to insure that the accuracy of the measurement is maintained by removing the unwanted pulse (i.e. the calculations will be based on full reflected pulses at the occurrence of a fault rather than the first extraneous pulse) and, as suggested by Westrom, the combination would have allowed quick repair or replacement of a transmission line fault by providing an exact location of the problem (column 1, lines 22-27).

Although the invention of Liggett and Westrom doesn't specifically disclose aligning the template signal and the correlated signal to determine a point of alignment, it is considered inherent that in order for the template signal to be subtracted from the correlated signal to correctly remove the near-end echo pulse, the signals must first be properly aligned.

With respect to claim 2, Liggett teaches correlating the generated sequence and the reflected sequence to generate a correlated signal for processing. Westrom teaches obtaining a template signal by sending actual pulses, consistent with actual implementation, to obtain the near-end signal created by the line interface.

Therefore the combination of the inventions of Liggett and Westrom would have provided a template signal as a correlated version of a reflection created by a line interface. Similarly, with respect to claim 27, since the invention of Westrom and Liggett teaches determining a time difference between the start of the signal, corresponding to the point where the line interface causes a near-end echo, and a subsequent peak, the invention also teaches determining a time difference between the receipt of the near-end echo and a subsequent peak.

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of U.S. Patent No. 4,963,020 to Luthra et al.

As noted above, Liggett teaches all the features of the claimed invention except for determining the location of a line anomaly by processing coefficients of a prediction filter.

Luthra teaches a method for detecting splices in an optical fiber using a time domain reflectometer that transmits a light pulse into an optical fiber and receives a reflected signal, which is stored in a memory, (column 2, lines 8-15) and also passed to a linear prediction filter (column 2, lines 29-38) (i.e. a finite impulse response filter) (column 2, lines 55-57), that has weights, corresponding to its coefficients (column 3, lines 50-54), which are used for determining a future signal to predict the splice (i.e. line anomaly) (column 2, line 67 to column 3, line 10). Luthra also teaches that the correlation filter be used to detect a splice by comparing the output of the correlation filter with a threshold (column 5, lines 19-26).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett to include determining the location of a line anomaly by processing coefficients of a prediction filter, as taught by Luthra, because, as suggested by Luthra, the combination would have removed decaying exponential portions of the reflected signal to provide only the desired information pertaining to line anomalies thereby improving analysis (column 2, lines 29-38).

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of U.S. Patent Application Publication No. 2002/0114383-A1 to Belge et al.

As noted above, the invention of Liggett teaches all the features of the claimed invention except for specifying that the processing of the reflected sequence be used to determine the location an impedance mismatch corresponding to a load coil.

Belge teaches systems and methods for characterizing transmission lines using broadband signals in a multi-carrier DSL environment including performing time domain reflectometry by sending a signal over the DLS channel and analyzing the reflected echo to determine any impedance discontinuity (i.e. mismatch) caused by bridged taps, an open-end of the loop, load coils, or the like (0073 and 0076).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett to include specifying that the processing of the reflected sequence be used to determine the location an impedance mismatch caused by a

load coil because the combination would have allowed for the invention to detect and process the location of a wider variety of faults occurring on a DSL line.

9. Claims 13 and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom et al. and further in view of U.S. Patent No. 5,029,184 to Andren et al.

As noted above, the invention of Liggett, Amrany, and Westrom teaches all of the features of the claimed invention except for adding a rotated reflection signal to the correlated signal to reduce or remove artifacts on the correlated signal.

Andren teaches a method for low probability of intercept on a communication system including means for sending as signal and receiving its reflection (column 10, lines 50-59) as well as adding a rotated version of the correlated rotated reflection signal to a correlated reflection signal to reduce artifacts (column 10, line 60 to column 11, line 15).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include adding a rotated reflection signal to the correlated signal, as taught by Andren, because, as suggested by Andren, the combination would have provided a means for eliminating sections of the signal that do not correspond to peaks of interest thereby improving the analysis and identification of the desired peaks (column 10, line 60 to column 11, line 15).

10. Claims 21, 22, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom, and further in view of U.S. Patent No. 4,597,183 to Broding.

As noted above, Liggett in combination with Amrany and Westrom teaches many of the features of the claimed invention including calculating the distance to an impedance mismatch using a time interval and propagation rate, but does not teach multiplying a time interval from the start of reflection to the occurrence of a signal component, indicating a fault, by one-half the rate of propagation of the reflection through the communication channel to determine the distance between one end of the communication channel and the impedance mismatch.

Broding teaches a method and apparatus for measuring a length of a cable using time domain reflectometry by transmitting a pulse sequence over the communication channel (column 10, lines 35-41) and, upon the detection of its reflection, calculating the length of the round trip of the signal through the cable by multiplying a time interval between the generation of the sequence and a signal component indicating the reflection by the velocity of propagation. Broding also teaches the equivalent method for determining only the length of the cable during the initial trip by multiplying a time interval between the generation of the sequence and the signal component indicating reflection, or equivalently the time interval between the signal component indicating reflection and the initial generation of the sequence, by one-half and the velocity of propagation (column 2, lines 48-61).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include multiplying a time interval from the start of reflection to the occurrence of a signal component, indicating a fault, by one-half the rate of propagation of the reflection through the communication channel to determine the distance between one end of the communication channel and the impedance mismatch, as taught by Broding, because Broding suggests an equivalent method for calculating the distance to a location down a cable using a method that will determine the exact distance to the point of interest, which can then be used for immediate analysis, rather than determining the round trip distance to and from the point of interest (column 2, lines 48-61).

11. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom and Broding, and further in view of U.S. Patent No. 5,523,758 to Harmuth.

As noted above, Liggett in combination with Amrany, Westrom, and Broding teaches many of the features of the claimed invention including generating a maximum length sequence with a plurality of taps, but does not specify that the cross-correlation be performed using a sliding tapped delay line.

Harmuth teaches a method for receiving and processing reflected radar signals (column 1, lines 6-10) using cross-correlation performed by a sliding correlator over discreet taps of a circuit-delayed line (column 3, lines 40-58). Harmuth also teaches

that the input signal arriving is fed into a tapped analog delay circuit to produce a tapped delay line (column 3, lines 30-35).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, Westrom, and Broding to include specifying that the cross-correlation be performed using a sliding tapped delay line, as taught by Harmuth, because, as suggested by Harmuth, using a tapped delay line would have yielded a better approximation of the correlation (column 3, lines 49-52) and, by using a sliding correlator, allowed the processing of a wider variety of pulses received by increasing the speed of processing (column 1, lines 36-43).

12. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom, and Broding and further in view of U.S. Patent No. 5,029,184 to Andren et al.

As noted above, Liggett in combination with Amrany, Westrom, and Broding teaches all of the features of the claimed invention except for adding a rotated reflection signal to the correlated signal to reduce or remove artifacts on the correlated signal.

Andren teaches a method for low probability of intercept on a communication system including means for sending a signal and receiving its reflection (column 10, lines 50-59) as well as adding a rotated version of a correlated rotated reflection signal to a correlated reflection signal to reduce artifacts (column 10, line 60 to column 11, line 15).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, Westrom, and Broding to include adding a rotated reflection signal to the correlated signal to reduce or remove artifacts on the correlated signal, as taught by Andren, because, as suggested by Andren, the combination would have provided a means for eliminating sections of the signal that do not correspond to peaks of interest thereby improving the analysis and identification of the desired peaks (column 10, line 60 to column 11, line 15).

13. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 4,041,381 to Hwa.

As noted above, the invention of Liggett, Amrany, and Westrom teaches all the features of the claimed invention except for specifying that the method be performed by an integrated circuit.

Hwa teaches methods and equipment for testing reflection points of transmission lines by transmitting a digital word from a maximal length sequence generator (column 2, lines 1-5) over a cable communication channel and receiving a reflection signal to indicate the occurrence of an impedance mismatch (column 1, lines 6-12). Hwa also teaches implementing the method using circuitry located on an integrated circuit (column 6, lines 40-49).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include specifying that the method be

performed by an integrated circuit, as taught by Hwa, because as suggested by Hwa the combination would have provided a device that could be manufactured cheaply and compactly so as to be used in a plurality of digital equipment (column 6, lines 40-49).

14. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom, and further in view of U.S. Patent No. 4,980,585 to Bazes.

As noted above, Liggett in combination with Amrany and Westrom teaches many of the features of the claimed invention including generating a maximum length sequence with a plurality of taps, but does not specify that the sequence generator comprises a tapped delay line.

Bazes teaches a method and apparatus for synthesizing digital waveforms ifor use in pseudo-random waveform generation by including a generation circuit comprising a tapped delay line (column 3, lines 10-26).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include specifying that the sequence generator comprises a tapped delay line, as taught by Bazes, because Liggett, Amrany, and Westrom teach generation of a pseudo-random sequence code generator including a plurality of taps (Liggett, column 5, lines 25-39) and Bazes suggests an equivalent method for generating such code using taps that has a

construction that allows easy manipulation of the output code thereby simplifying the code generation process (column 3, lines 10-26).

15. Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom, and further in view of U.S. Patent No. 5,523,758 to Harmuth.

As noted above, Liggett in combination with Amrany and Westrom teaches many of the features of the claimed invention including generating a maximum length sequence with a plurality of taps, but does not specify that the cross-correlation be performed using a sliding tapped delay line.

Harmuth teaches a method for receiving and processing reflected radar signals (column 1, lines 6-10) using cross-correlation performed by a sliding correlator over discreet taps of a circuit-delayed line (column 3, lines 40-58). Harmuth also teaches that the input signal arriving is fed into a tapped analog delay circuit to produce a tapped delay line (column 3, lines 30-35).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany and Westrom to include specifying that the cross-correlation be performed using a sliding tapped delay line, as taught by Harmuth, because, as suggested by Harmuth, using a tapped delay line would have yielded a better approximation of the correlation (column 3, lines 49-52) and, by using a sliding correlator, allowed the processing of a wider variety of pulses received by increasing the speed of processing (column 1, lines 36-43).

16. Claims 45, 46, 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 6,075,628 to Fisher et al.

As noted above, Liggett in combination with Amrany and Westrom teaches all the features of the claimed invention except for including a scrambler in the sequence generator.

Fisher teaches a method for determining fault locations in communication systems using time domain reflectometry (column 1, lines 4-6) wherein the sequence generator includes a data scrambler (column 2, lines 64-65) and a controller for controlling an optical transmitter sending the sequence (column 2, lines 37-40 and Figure 1).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include a scrambler in the sequence generator, as taught by Fisher, because, as suggested by Fisher, the combination would have scrambled the data such that the downstream transmitted data sequence has statistical properties equivalent to those of a continuous random binary sequence and therefore allowed the data itself to be used in the correlation process (column 2, line 64 to column 3, lines 4).

17. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett

in view of Amrany, Westrom, and Fisher and further in view of U.S. Patent No. 6,417,672 to Chong.

As noted above, Liggett in combination with Amrany, Westrom, and Fisher teaches all the features of the claimed invention except for specifying that the peak voltage of the sequence signal be less than 18 volts.

Chong teaches a method for detecting a bridge tap using frequency domain analysis through time-domain reflectometry to determine an impedance mismatch (column 4, lines 11-20) wherein a test set provides an input signal having a voltage of 20 volts peak-to-peak (i.e. a peak voltage of 10 volts) (column 11, lines 1-14).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, Westrom, and Fisher to include specifying that the peak voltage of the sequence signal be less than 18 volts, as taught by Chong, because the invention of Liggett, Amrany, Westrom, and Fisher teaches using a relatively low voltage to reduce the probability of cross-talk and, while Liggett and Westrom are silent on this voltage, Chong provides a voltage that would meet this requirement. It also would have been obvious to one having ordinary skill in the art to apply any voltage that is small enough to meet this cross-talk elimination since the applicant fails to provide criticality to the selection of 18 volts.

18. Claims 50, 51, and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 5,144,250 to Little and U.S. Patent No. 5,523,758 to Harmuth.

As noted above, the invention of Liggett, Amrany, and Westrom teaches many of the features of the claimed invention including obtaining a time between the start of the correlation signal and a subsequent peak caused by the echo from a line anomaly but does not teach a corresponding device for measuring this time, specifically a timer that comprises a counter configured to count the samples between the start of the signal and a subsequent peak. This combination also doesn't specifically disclose that the cross-correlation be performed using a sliding tapped delay line in the correlator during communication.

Little teaches a power amplifier time domain reflectometer, and corresponding method, comprising generating a modulated RF signal (column 2, lines 35-36), which is conducted on an output line to a plurality of system components which are to be tested for an impedance failure, and a bi-directional coupler that detects the waveform of the output RF signal and the waveform of the reflect RF signal caused by an impedance fault (column 1, lines 55-60). Little also teaches that the beginning of the output signal waveform is used to trigger a timing device which continues timing until the beginning of the reflected signal waveform is detected (column 1, line 60 to column 4) wherein the timing device comprises a counter that counts sample pulses between the start of the signal and a subsequent peak caused by the echo from the impedance failure (column 2, line 52 to column 2, line 12).

Harmuth teaches a method for receiving and processing reflected radar signals (column 1, lines 6-10) using cross-correlation performed by a sliding correlator over discreet taps of a circuit-delayed line (column 3, lines 40-58). Harmuth also teaches

that the input signal arriving is fed into a tapped analog delay circuit to produce a tapped delay line (column 3, lines 30-35).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include a timer that comprises a counter configured to count the samples between the start of the signal and a subsequent peak, as taught by Little, because the combination would have provided a timing device needed in the invention of Liggett, Amrany, and Westrom and, as suggested by Little, provided a simplified method for performing time domain reflectometry in the Gigahertz frequency range (column 1, lines 45-47).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, and Westrom to include specifying that the cross-correlation be performed using a sliding tapped delay line in the correlator during communication, as taught by Harmuth, because, as suggested by Harmuth, using a tapped delay line would have yielded a better approximation of the correlation (column 3, lines 49-52) and, by using a sliding correlator, allowed the processing of a wider variety of pulses received by increasing the speed of processing (column 1, lines 36-43).

19. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom, Little, and Harmuth and further in view of U.S. Patent No. 6,122,652 to Jin et al.

As noted above, the Liggett in combination with Amrany, Westrom, Little, and Harmuth teaches many the features of the claimed invention including correlating a generated signal with a reflected signal and determining the position of detected peaks of the reflected waveform using a pulse detecting counter, but does not teach specifying that the peak detector comprises a comparator and a register for storing a current peak value.

Jin teaches a method for detecting a tone or any other periodical signal in a telephone system (column 1, lines 5-6) by segmenting the data signal into fixed length data samples, counting, with a counter, the data samples to prepare a data window therefrom, a peak value detector to monitor the data samples and to detect a sample having a peak value with the data window (column 2, lines 22-29), and a correlation unit (column 2, lines 48-49) wherein the peak detector comprises a comparator and memory (i.e. register) holding a current peak value (column 6, lines 29-33 and 39-46) and the correlation unit functions using a comparator and a counter (column 8, lines 18-34).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany, Westrom, Little, and Harmuth to include specifying that the peak detector comprises a comparator and a register for storing a current peak value, as taught by Jin because, as suggested by Jin, the combination would have insured that any calculations made using a received peak voltage would be made with respect to the correct value by resetting the detector with the current value after a predetermined count (column 4, lines 63-65 and column 6, lines 46-47) and allow

for the determination of whether the correlated value lies with in a desired range (column 9, lines 30-39), as would be needed to discriminate between the correlated result of the received pulses, correlated with the generated sequence, and the correlated result of any extraneous noise pulses, correlated with the generated sequence, in the invention of Liggett, Amrany, Westrom, and Harmuth.

20. Claim 54 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany, Westrom, Little, and Harmuth and further in view of U.S. Patent No. 6,292,539 to Eichen et al.

As noted above, Liggett in combination with Amrany, Westrom, Little, and Harmuth teaches all the features of the claimed invention except for specifying that the sequence signal does not generate disruptive cross-talk in adjacent pairs in a binder that also contains the twisted pair conductor.

Eichen teaches a method and apparatus for digital subscriber loop qualification including a digital subscriber loop with a structure including bridge taps, load coils, and a binder group (i.e. a group of twisted pairs bundled together) (column 2, lines 3-9).

Since the invention of Liggett, Amrany, Westrom, Little, and Harmuth teaches minimizing the voltage of the sequence signal to lower the possibility of cross-talk occurring across various twisted pairs (Liggett, column 5, lines 9-12) and Eichen teaches that a group of twisted pairs bundled together makes up a binder group, it would have been obvious to one having ordinary skill in the art to modify the

invention of Liggett, Amrany, Westrom, Little, and Harmuth to include lowing the voltage of the sequence signal to further reduce the possibility of cross-talk between adjacent twisted pairs in a binder because the combination would have prevented unwanted interference in a plurality of DSL environments thereby creating greater utility of the invention.

21. Claim 68 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liggett in view of Amrany and Westrom and further in view of U.S. Patent No. 6,122,652 to Jin et al.

As noted above, Liggett in combination with Amrany, Westrom teaches many the features of the claimed invention including correlating a generated signal with a reflected signal and determining the position of detected peaks of the reflected waveform, but does not teach specifying that the correlation processing comprises a compare routine and a counter.

Jin teaches a method for detecting a tone or any other periodical signal in a telephone system (column 1, lines 5-6) by segmenting the data signal into fixed length data samples, counting, with a counter, the data samples to prepare a data window therefrom, a peak value detector to monitor the data samples and to detect a sample having a peak value with the data window (column 2, lines 22-29), and a correlation unit (column 2, lines 48-49) wherein the peak detector comprises a comparator and memory (i.e. register) holding a current peak value (column 6, lines

29-33 and 39-46) and the correlation unit functions using a comparator and a counter (column 8, lines 18-34).

It would have been obvious to one having ordinary skill in the art to modify the invention of Liggett, Amrany and Westrom to include specifying correlation processing comprises a compare routine and a counter, as taught by Jin, because, as suggested by Jin, the combination would have insured that any calculations made using a received peak voltage would be made with respect to the correct value by resetting the detector with the current value after a predetermined count (column 4, lines 63-65 and column 6, lines 46-47) and allow for the determination of whether the correlated value lies with in a desired range (column 9, lines 30-39), as would be needed to discriminate between the correlated result of the received pulses, correlated with the generated sequence, and the correlated result of any extraneous noise pulses, correlated with the generated sequence, in the invention of Liggett, Amrany and Westrom.

Allowable Subject Matter

22. Claims 6 and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims because while the cited prior art does teach adding a correlated rotated reflection signal to the correlated reflections signal, none of the cited prior art teaches or suggests, in combination with the other claimed

limitations for performing time domain reflectometry, obtaining the rotated signal by correlating a rotated test/transmitted signal with a rotated received/reflected signal.

Response to Arguments

23. Applicant's arguments with respect to claims 1-13, 21-30, 40-54, and 60-70 have been considered but are moot in view of the new ground(s) of rejection.

Several arguments, however, are noted:

Applicant first asserts the Examiner has not considered the Joint Declaration filed March 25, 2003. The Examiner asserts that the Declaration was considered and several arguments were presented in the Final Office action with respect to the position presented therein. However, for clarification purposes, the Examiner has further responded to the Declaration below.

Applicant also argues that there is no motivation to combine the references of Liggett, Amrany, and Westrom stating that the Examiner "often cites a passage within a reference for teaching a claim element and a passage within the reference generally indicating that this claim element is generally desirable. The Examiner then improperly asserts that this cited passages comprises a motivation or suggestion to combine this elements into the other prior art references." The Examiner maintains that Applicant has not clearly indicated why these cited passages are not sufficient motivation.

Applicant then agues that "no suggestion is made within the Liggett reference to implement the disclosed system into a communication device. Absent such a

suggestion to combine in the Liggett reference or the other references, the Liggett reference cannot be used in an obviousness rejection."

The Examiner first asserts that the grounds of rejection has been changed since the handheld device of Liggett is a communication device, thereby rendering this argument moot. However, since the combination of Liggett and Amrany has been maintained the Examiner also asserts that motivation does exist since Amrany suggests that the combination would have reduced costs by using existing circuitry rather than requiring separate circuitry, improved testing by allowing testing using DSL frequencies, and eliminated the need for test equipment that may introduce disturbance effects (column 1, lines 40-47 and column 6, lines 19-29).

Applicant also argues the combination of the invention of Westrom because, "Westrom teaches away from the present invention by use of a high power pulse in other than a communication device."

The Examiner maintains that the teaching of Westrom does not teach away from the invention of Liggett because there is no teaching in the invention of Westrom that the specific processing aspects to which the Examiner is relying cannot be used in the system of Liggett.

Further, the Examiner recognizes that it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*,

977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, the instant invention, the invention of Liggett, and the invention of Westrom are all concerned with performing time domain reflectometry. Further, the invention of Westrom is only included to teach a method for removing the unwanted near-end echo and a method for measuring the location of the fault in the communication line. Both of these features are not dependent on the fact that Westrom is for use in higher power transmission lines and would be applicable in the invention of Liggett.

Applicant also argues that the invention of Amrany cannot be combined with the invention of Liggett because "the method of time domain reflectometry taught by Amrany is substantially different from that claimed . . . The Amrany reference is simply another reference that teaches a well-known prior art path. Furthermore, and more importantly, the Examiner's rejection is improper because the Amrany does not teach correlation processing by use of a sequence signal as claimed."

The Examiner maintains that the invention Amrany is not included to teach of the processing aspects disclosed but is included to teach performing the method of Liggett using a modem device. The correlation processing by use of a sequence signal is already taught by the invention of Liggett.

Applicant then argues the Examiner's assertion that any signal that can be integrated has some autocorrelation properties stating, "these statements are provided without any support other than a definition of auto-correlation. More

troubling, these statements are simply wrong. Not all signals have autocorrelation properties and a signal's ability to be integrated is not related to its correlation properties."

The Examiner also maintains that given the definition of autocorrelation, if a signal is continuous real-time signal that can be integrated, it will have an autocorrelation property.

Applicant further states that based on the definition of auto-correlation "only the limited set of sequence signal that meet this specific mathematically requirement have auto-correlation properties."

The Examiner maintains that given the definition, there is no mathematic requirement to be met. The definition only states that to determine the auto-correlation of a given signal, the signal as a function of t and the signal as a function of $t+\tau$ are multiplied and integrated. Thus any signal that can be integrated in such a manner has an auto-correlation property.

Applicant also argues that with respect to the Examiner's assertion that it is inherent that the template signal must first be aligned before being subtracted that "it is not inherent and the Appellant's position is supported by the Declaration."

The Examiner again asserts that Applicant has not included any support as to why this inherency is not correct. Further, the Declaration does not contain any mention as to this argument as Applicant suggests.

Applicant also argues that the teaching of Westrom with respect to this limitation "has nothing to do with near end echo, but instead deals with the problem of masking a close reflection with the high power pulse."

The Examiner maintains that as noted above, the invention of Ligget teaches that the near-end echo pulse is undesired and not used in measurements (column 7, lines 30-37) and Westrom provides a corresponding method to insure that the accuracy of the measurement is maintained by removing the unwanted pulse (column 9, lines 9-21).

Applicant also argues that "the Belge reference teaches a pulse type system as evidenced by paragraph 76. . . This very same paragraph expressly teaches [a]way form the claimed invention by admitting that 'analyzing the time domain of the echo signal becomes very complicated. For this reason, a model based approach can be used for the TDR estimations'."

The Examiner maintains that the invention of Belge does not teach away because it is only used to include processing of the reflected sequence to be used to determine the location of an impedance mismatch caused by a load coil. The invention of Liggett already teaches determining the location of a bridge tap using the complex processing and the invention of Belge then teaches that an impedance mismatch is also caused by a load coil.

Applicant then argues that "the claim limitation of claim 9 teaches processing the coefficients of a prediction filter, not working from an error term, as taught by the Luthra reference. Thus, the Luthra reference does not teach the claimed limitations and can not be used as a reference against Claim 9."

The Examiner maintains that Luthra teaches a method for detecting splices in an optical fiber using a time domain reflectometer that transmits a light pulse into an optical fiber and receives a reflected signal, which is stored in a memory, (column 2, lines 8-15) and also passed to a linear prediction filter (column 2, lines 29-38) (i.e. a finite impulse response filter) (column 2, lines 55-57), that has weights, corresponding to its coefficients (column 3, lines 50-54), which are used for determining a future signal to predict the splice (i.e. line anomaly) (column 2, line 67 to column 3, line 10).

Applicant also argues that "[w]ith regard to the Fisher reference . . . at a minimum does not disclose the claimed limitations, and even teaches away from the claimed invention. For example, the first limitation of Claim 45 requires 'a scrambler configured to generate a sequence signal.' However, Fisher at column 2, lines 64-67 teaches that the scrambler simply 'scrambles' the data and hence does not create the data."

The Examiner asserts that the scrambler is part of the sequence generator, as shown in Figure 1, and therefore is used in the sequence generation.

Response to Amendment

24. The declaration under 37 CFR 1.132 filed March 25, 2003, is insufficient to overcome the rejection of claims 1-13, 21-30, 40-54, and 60-70 based upon the combinations of the prior art as set forth in the last Office action because of the following reasons.

First, it states that the claimed subject matter solved a problem that was long standing in the art. However, there is no showing that others of ordinary skill in the art were working on the problem and if so, for how long. In addition, there is no evidence that if persons skilled in the art who were presumably working on the problem knew of the teachings of the above cited references, they would still be unable to solve the problem. See MPEP § 716.04.

Second, it refers only to the system described in the above referenced application and not to the individual claims of the application. As such the declaration does not show that the objective evidence of nonobviousness is commensurate in scope with the claims. See MPEP § 716.

For example, the Declaration states that the main feature of the claimed invention is for including sequence signal TDR with convolution on a communication device (Item 10).

Firstly, it is noted that the Declaration indicates that such complex processing is common in stand alone test equipment (Item 6) and since independent claims 7, 21, 45, 50, and 65 only recite performing complex processing in a "communication device" which would encompass a piece of stand alone test equipment, this

inventive idea is not present in these claims. (See for example, page 11, line 15 to page 12 line 3 of the instant specification which state, "The CPE 100 comprises any communication device that is generally located remote from the communication interface 102 and configured to facilitate communication over the first line 104. In one embodiment, the CPE 100 comprises a communication modem or communication device located at a business or residence. The CPE 100 may comprise, but is not limited to, any device operating under the digital subscriber line (DSL) standard, any voice band modem, cable modem, wireless modem, power line modem, or any other device configured to perform digital or analog communication. It is contemplated that contained in the CPE 100 and the communication interface 102 there is a receiver and transmitter configured to send and receive data over the line 104."

Secondly, the Declaration states that such complex processing, as defined by correlation or convolution, has not been carried out in a communication device (Items 10, 13, 17, and 19). Independent claims 7 and 45 do not contain any limitations for such complex correlation or convolution and therefore fall under the prior art path of performing non-complex TDR in a communication device.

It is also noted that when an applicant submits evidence traversing a rejection, the examiner must reconsider the patentability of the claimed invention. The ultimate determination of patentability must be based on consideration of the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of

any arguments and any secondary evidence. In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). The submission of objective evidence of patentability does not mandate a conclusion of patentability in and of itself. In re Chupp, 816 F.2d 643, 2 USPQ2d 1437 (Fed. Cir. 1987). Facts established by rebuttal evidence must be evaluated along with the facts on which the conclusion of a prima facie case was reached, not against the conclusion itself. In re Eli Lilly, 902 F.2d 943, 14 USPQ2d 1741 (Fed. Cir. 1990). In other words, each piece of rebuttal evidence should not be evaluated for its ability to knockdown the prima facie case. All of the competent rebuttal evidence taken as a whole should be weighed against the evidence supporting the prima facie case. In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984). Although the record may establish evidence of secondary considerations which are indicia of nonobviousness, the record may also establish such a strong case of obviousness that the objective evidence of nonobviousness is not sufficient to outweigh the evidence of obviousness. Newell Cos. v. Kenney Mfg. Co., 864 F.2d 757, 769, 9 USPQ2d 1417, 1427 (Fed. Cir. 1988), cert. denied, 493 U.S. 814 (1989); Richardson-Vicks, Inc., v. The Upjohn Co., 122 F.3d 1476, 1484, 44 USPQ2d 1181, 1187 (Fed. Cir. 1997).

In the instant case, while U.S. Patent No. 6,534,996 to Amrany is not included in the Declaration, Amrany clearly indicates the desirability for combining the processing of Liggett into a communication device such as a modem. Further, as noted above, the Declaration submits that correlation and convolution are indicative of complex processing and since the invention of Amrany carries out

convolution/deconvolution (column 8, lines 18-22 and column 9, lines 9-18 and 51-57), this is considered to be complex processing. Since Amrany indicates the desirability of the combination as well as suggests the use of complex processing in a DSL modem, the combination is proper and the information provided by the Declaration does not overcome the case of obviousness.

The Declaration also indicates that the Westrom and Broding references should not be used because they "deal[s] with test equipment for high voltage transmission lines" and "well drilling", respectively, and are therefore not within the technology field of communication. The Examiner asserts that this statement is harmonious to indicating that the references cannot be used because they are non-analogous and it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, the inventions of Westrom and Broding are concerned with improving the processing of time-domain reflectometry and are therefore analogous.

Conclusion

25. The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure.

U.S. Patent No. 6,646,451 to Lanan teaches a dime domain reflectometer display method that shifts and/or reverses a reflected signal to eliminate correlation artifacts.

U.S. Patent No. 6,064,695 to Raphaeli teaches a spread spectrum communication system utilizing differential code shift keying.

U.K. Patent Application Publication No 2 303 754 to Matich et al. teaches a ranging system that correlates a received signal with a shifted code to eliminate correlation artifacts.

26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey R. West whose telephone number is (703)308-1309. The examiner can normally be reached on Monday through Friday, 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S. Hoff can be reached on (703)308-1677. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7382 for regular communications and (703)308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

jrw
August 9, 2004

MARC S. HOFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800